

## EUROPEAN PATENT OFFICE

## Patent Abstracts of Japan

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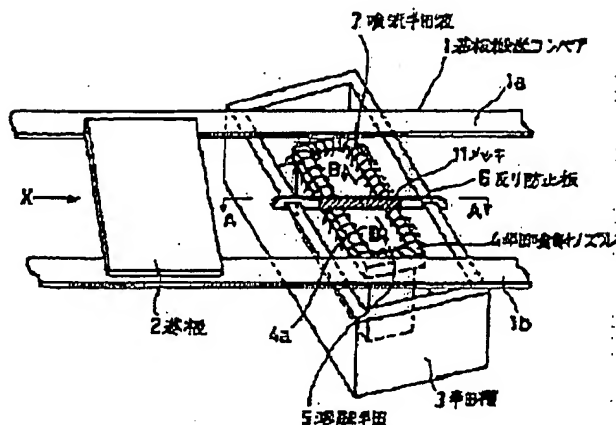
APPLICATION DATE : 28-08-96  
APPLICATION NUMBER : 08226535

APPLICANT : TOSHIBA CORP;

INVENTOR : KIYONO NAOHARU;

INT.CL. : H05K 3/34 B23K 1/08 B23K 3/00

TITLE : SOLDERING DEVICE



**ABSTRACT :** PROBLEM TO BE SOLVED: To make it possible to solder fully and evenly also to a part, on which a substrate is passed through, of a warpage prevention plate by a method wherein a plating, which has a wettability with solder, is applied to at least a part, which is dipped in a jet solder liquid, of the warpage prevention plate provided on the upper part of a solder tank.

**SOLUTION:** A preheated substrate 2 is passed through over a solder tank 3 and at this time, as roughly the center of the substrate 2 is supported by a warpage prevention plate 6, the substrate 2 is never warped in the direction under its lower part by its tare weight, heating or the like. The jet of a molten solder 5, which is jetted through solder jet nozzles 4, comes into contact with the lower surface of the substrate 2 and the molten solder 5 is adhered to a soldering position on the substrate 2. At this time, as a plating 11 having a wettability with solder is applied to a part, which is dipped in a jet solder liquid 7, of the plate 6, the liquid 7 loses its resistance to the plate 6 and the plate 6 is coated up to its upper part with the solder 5.

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none

none

none

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PN - JP10070360 A 19980310  
 PD - 1998-03-10  
 PR - JP19960226535 19960828  
 OPD - 1996-08-28  
 TI - SOLDERING DEVICE  
 IN - KIYONO NAOHARU  
 PA - TOKYO SHIBAURA ELECTRIC CO  
 IC - H05K3/34 ; B23K1/08 ; B23K3/00

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TI - Jet stream soldering apparatus for soldering various electronic components on printed substrate - in which part of curvature prevention part is coated with plating containing solder wettability nature that is immersed in jet stream solder

PR - JP19960226535 19960828

PN - JP10070360 A 19980310 DW 199820 H05K3/34 004pp

PA - (TOKE ) TOSHIBA KK

IC - B23K1/08 ; B23K3/00 ; H05K3/34

AB - J10070360 The apparatus has a substrate conveyor (1) which conveys a substrate (2), by supporting both ends of the substrate. A solder tank (3) which has a solder injection nozzle (4) is arranged underneath the substrate conveyor. This nozzle injects fused solder (5) towards upside. A curvature prevention board (6) is provided on upper surface of solder tank, in substrate conveyance direction. This board contacts undersurface of conveyed substrate, to prevent generation of curvature of substrate. A plating (11) with solder wettability nature is given to a part of the board immersed in the jet stream solder (7).

- ADVANTAGE - Prevents crack generation in jet stream solder. Ensures uniform soldering.

- (Dwg. 1/6)

OPD - 1996-08-28  
 AN - 1998-227102 [20]

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I - H05K3/34 ; B23K1/08 ; B23K3/00

none

none

none



(2)

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## 【特許請求の範囲】

【請求項1】 基板の両側端を支持して前記基板を搬送する基板搬送コンベアと、

該基板搬送コンベアの下方に配置され、溶融半田を上方に噴射する半田噴射ノズルを有する半田槽と、

該半田槽の上部で基板搬送方向に延設され、搬送されてくる前記基板の下面に当接して前記基板の反りの発生を防止する反り防止板とを備えた半田付装置において、

前記反り防止板の少くとも噴流半田波に浸漬する部分に半田濡れ性を有するメッキを施したことを特徴とする半田付装置。

【請求項2】 前記半田噴射ノズルを基板搬送方向に対して20度乃至50度の角度に配置したことを特徴とする請求項1記載の半田付装置。

## 【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、噴流方式を用いた半田付装置に係り、特に各種電気製品に用いられている印刷基板に自動的に半田付を行う半田付装置に関する。

【0002】

【従来の技術】図4に従来の噴流方式を用いた半田付装置の一例の概略構成を示す。図4において、所定の間隔で平行に配置された左右1対の搬送レーン1a、1bを有する基板搬送コンベア1上には印刷基板2が載置される。印刷基板2は両側端が搬送レーン1a、1bに支持された状態で、基板搬送コンベア1により天印X方向に搬送される。

【0003】基板搬送コンベア1の下方には半田槽3が配置されており、半田槽3内には半田噴射ノズル4が設けられている。半田噴射ノズル4は半田槽3内の溶融半田5を上方に噴射させる。また、半田槽3の上面のほぼ中央には、基板搬送方向Xに平行に直線状の反り防止板6が設けられている。

【0004】上記構成において、フラックス塗布過程及び予熱過程を経た基板2が基板搬送コンベア1により搬送されると、半田槽3の上方を通過するときに半田噴射ノズル4から噴射される溶融半田5が基板2の下面に当り、所定箇所に溶融半田5が付着する。このとき基板2は反り防止板6により支持されているため、基板2が下方に反って溶融半田5の噴流に対して必要以上に接近しすぎる、いわゆる基板2のむぐり込みが防止される。

【0005】

【発明が解決しようとする課題】半田噴射ノズル4は、基板2に対して充分な量の溶融半田5を均一に付着させるため、通常図4に示すように基板搬送方向Xに対して所定の角度傾斜して配置されている。半田噴射ノズル4が基板搬送方向Xに対して90度の角度で配置されている場合は、反り防止板6に対して溶融半田5の噴流半田波の進行方向が平行となるため、反り防止板6に対する抵抗が小さい。従って噴流半田のレベルを反り防止板6

より若干高くすることにより反り防止板6が噴流半田波の中に沈み込み、波割れ現象が発生するおそれがあった。

【0006】しかしながら図4に示すように反り防止板6を基板搬送方向Xに平行に配置し、半田噴射ノズル4を基板搬送方向Xに対して傾斜して配置した場合は、図5に示すように噴流半田波7が反り防止板6に当たる部分の上面8で、波割れ部分9が発生する。この波割れ部分9は半田噴射ノズル4の基板搬送方向Xの両端部9a、9cに近づく程大きく、中央部9bでは比較的小さい。この結果図6に示すように、基板2の反り防止板6が通過する部分10における半田付け状態は、半田付けなしまたは半田不均一などの不良が発生するという問題があった。

【0007】本発明はこのような状況に鑑みてなされたもので、反り防止板により発生する噴流半田波の波割れ現象を解消し、反り防止板の通過部分の半田付け不良をなくして、良好な半田付けを行うことのできる半田付装置を提供することを目的とする。

【0008】

【課題を解決するための手段】上記目的を達成するため、請求項1に記載の本発明は、基板の両側端を支持して前記基板を搬送する基板搬送コンベアと、該基板搬送コンベアの下方に配置され、溶融半田を上方に噴射する半田噴射ノズルを有する半田槽と、該半田槽の上部で基板搬送方向に延設され、搬送されてくる前記基板の下面に当接して前記基板の反りの発生を防止する反り防止板とを備えた半田付装置において、前記反り防止板の少くとも噴流半田波に浸漬する部分に半田濡れ性を有するメッキを施したことを特徴とする。

【0009】請求項2に記載の本発明は、前記半田噴射ノズルを基板搬送方向に対して20度乃至50度の角度に配置したことを特徴とする。

【0010】本発明の半田付装置によると、反り防止板の噴流半田波に浸漬する部分に半田濡れ性を有するメッキを施したので、噴流半田波の反り防止板に対する抵抗がなくなり、反り防止板の上部まで半田で覆うことができる。この結果、半田噴射ノズルを基板搬送方向に対して20度乃至50度の角度に配置しても、反り防止板により発生する噴流半田波の波割れ現象を解消して、良好な半田付けを行うことができる。

【0011】

【発明の実施の形態】以下、本発明の半田付装置の一実施の形態を図面を参照して説明する。図1は本発明の半田付装置の一実施の形態の概略構成を示す要部斜視図である。図1において、図4に示す従来例の部分に対応する部分には同一の符号を付してある。

【0012】図1において、所定の間隔で平行に配置された左右1対の搬送レーン1a、1bを有する基板搬送コンベア1上には、所定の配線パターンが印刷された基

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板2が載置され、基板2は両側端が搬送レール1a、1bに支持された状態で、図示しない駆動装置により駆動される基板搬送コンベア1により矢印X方向に搬送される。

【0013】基板搬送コンベア1の下方には角面状の半田槽3が配置されており、半田槽3内には長手方向に半田噴射ノズル4が設けられている。半田噴射ノズル4の上部には搬送レール1a、1b間で開口する矩形状のノズル口4aが形成されており、半田噴射ノズル4は基板搬送方向Xに対して20度乃至50度の角度に配置されている。また半田槽3の上面の搬送レール1a、1b間の中心には、搬送レール1a、1bに平行に反り防止板6が取り付けられている。

【0014】反り防止板6は半田が付着せず強度的に優れている薄板状のステンレス鋼で構成されており、上端面が搬送レール1a、1bの上面とほぼ同一面上に位置するように配置されている。また反り防止板6が半田噴射ノズル4から噴射される半田5により浸漬される部分には、リン酸などの薬品を助剤として用いた半田濡れ性を有するメッキ11が施されている。

【0015】次に上記のように構成された本実施の形態による半田付装置の作用について説明する。電子部品の仮マウントなどを終えた基板2は1対の搬送レール1a、1bに載せられ、基板搬送コンベア1により搬送される。基板2は先ず図示しないフラックスによりフラックスを塗布され、その後図示しない予熱ヒータにより予備加熱される。

【0016】予備加熱された基板2は次に半田槽3上を通過し、このとき反り防止板6により基板2のほぼ中央が支持されるため、基板2が自重や加熱などによって下方に反ることはない。そして基板2の下面には半田噴射ノズル4から噴射される溶融半田5の噴流が接触して、基板2の半田付け位置に溶融半田5が付着する。このとき反り防止板6が噴流半田波7に浸漬される部分に半田濡れ性を有するメッキ11が施されているので、噴流半田波7は反り防止板6に対する抵抗がなくなり、図2、3に示すように溶融半田5は反り防止板6の上部まで被覆する。

【0017】本実施の形態によれば、半田噴射ノズル4

を基板搬送方向Xに対して20度乃至50度の角度に配置しても、溶融半田5は反り防止板6の上部まで被覆するので、噴流半田波7の波割れ現象を解消して、反り防止板6の通過部分に発生する半田付着なしや不均一な半田付着を防止し、良好な半田付けを行うことができる。

【0018】上記の実施の形態では半田噴射ノズル4が基板搬送方向Xに対して20度乃至50度傾斜して配置されている場合について説明したが、この角度は20度乃至50度に限定されるものではなく、例えば90度の角度で配置された半田付装置に適用しても同様の効果が得られる。またメッキ11を反り防止板6の表面全体に施してもよい。さらに半田噴射ノズル4が複数設けられている場合には、反り防止板6が複数の半田噴射ノズル4に対向する部分にそれぞれメッキ11を施す。

【0019】

【発明の効果】以上説明したように、本発明の半田付装置によれば、半田槽の上部に設けられた反り防止板の少なくとも噴流半田波に浸漬する部分に、半田濡れ性を有するメッキを施したので、噴流半田波は反り防止板に対する抵抗がなくなり、溶融半田は反り防止板の上部まで被覆する。この結果、反り防止板により発生する噴流半田波の波割れ現象を解消して、反り防止板の通過部分にも十分にかつ均一に半田付けを行うことができる。

【図面の簡単な説明】

【図1】本発明の半田付装置の一実施の形態の概略構成を示す要部斜視図である。

【図2】図1のA-A線断面図である。

【図3】図1のB-B線断面図である。

【図4】従来の半田付装置の一例の概略構成を示す平面図である。

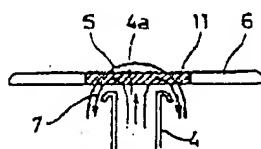
【図5】従来の波割れ現象を示す説明図である。

【図6】従来の波割れ現象による半田の付着状態を示す基板の平面図である。

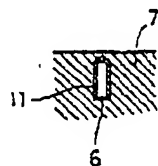
【符号の説明】

- |            |           |
|------------|-----------|
| 1 基板搬送コンベア | 2 基板      |
| 3 半田槽      | 4 半田噴射ノズル |
| 5 溶融半田     | 6 反り防止板   |
| 7 噴流半田波    | 11 メッキ    |

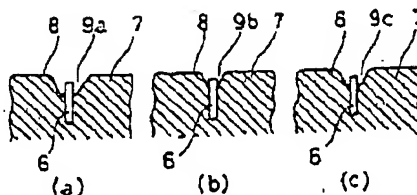
【図2】



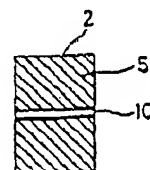
【図3】



【図5】



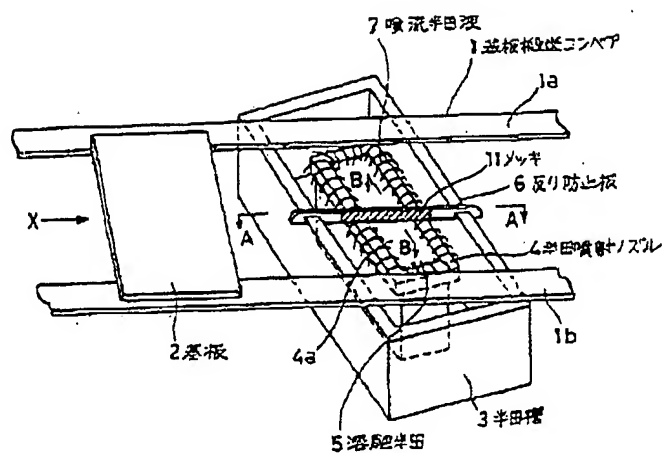
【図6】



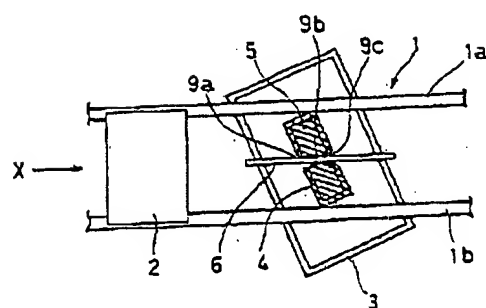
(4)

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【図1】



【圖4】



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B23K 3/00 310

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[Name] Takashi HONDA

(57) Abstract

[Problem to be solved] To eliminate an occurrence of wave-breaking phenomenon due to a jet-flowed solder wave by a bend-preventing plate, which is provided on a soldering device.

[Solution] A portion of the bend-preventing plate 6 provided at an upper portion of a soldering bath 3, the portion immersed in the jet-flowed solder wave 7 sprayed from a solder spray nozzle 4, is provided with a thin coating 11 having a solder wetting property, and a molten solder 5 covers an upper portion of the bend-preventing plate 6.

[Scope of Claims]

[Claim 1] A soldering device comprising:

a substrate feeding conveyer for supporting both side ends of a

substrate and feeding the substrate;

a soldering bath, which is disposed at a downward portion of the substrate feeding conveyer and has a solder spray nozzle for spraying a molten solder upward; and

a bend-preventing plate, which is provided at an upper portion of the soldering bath so as to extend in a substrate feeding direction and prevents an occurrence of bending of the substrate by coming into contact with a lower surface of the substrate to be fed,

in which at least a portion of the bend-preventing plate, that is immersed in a jet-flowed solder wave, is provided with a thin coating having a solder wetting property.

[Claim 2] The soldering device according to claim 1, in which the solder spray nozzle is disposed so as to have angles of 20 to 50 degrees with respect to the substrate feeding direction.

#### [Detailed Description of the Invention]

[0001]

[Field of the Invention] The present invention is related to a soldering device employing a jet-flow method, and more specifically, related to a soldering device for automatically soldering a printing substrate used in various electrical goods.

[0002]

[Related Art] Fig. 4 shows a schematic configuration of one example of the soldering device employing a conventional jet-flow method. In Fig. 4, the printing substrate 2 is put on a substrate feeding conveyer 1 having a pair of right and left feeding rails 1a, 1b, which are disposed in parallel with a predetermined distance. While both side ends of the printing substrate 2 are supported by the feeding rails 1a and 1b, the printing substrate 2 is fed by the substrate feeding conveyer 1 in a direction indicated by an arrowhead X.

[0003] A soldering bath 3 is disposed at a downward portion of the substrate feeding conveyer 1 and a solder spray nozzle 4 is provided in the soldering bath 3. The solder spray nozzle 4 sprays a molten solder 5 in the soldering bath 3 upward. At a substantially central portion of an upper surface of the soldering bath 3, a bend-preventing plate 6 having a linear shape is provided in parallel with a substrate feeding direction X.



[0004] With the above features, after the substrate 2, which has passed through a flux applying process and a preheating process, is fed by the substrate feeding conveyer 1, the molten solder 5 sprayed from the solder spray nozzle 4 runs into an under surface of the substrate 2 when the substrate 2 is passing through an upper portion of the soldering bath 3, and the molten solder 5 adheres to a predetermined portion of the substrate. At this time, since the substrate 2 is supported by the bend-preventing plate 6, a so-called "burrowing" of the substrate 2, i.e., the phenomenon that the substrate 2 is bent downward and comes close to a jet-flow of the molten solder 5 more than necessary is prevented.

[0005]

[Problem to be Resolved by the Invention] As shown in Fig. 4, in order to allow sufficient amount of molten solder 5 to adhere to the substrate 2 equally, the solder spray nozzle 4 is usually disposed so as to be slanted by a predetermined angle with respect to the substrate feeding direction X. In a case that the solder spray nozzle 4 is disposed so as to have an angle of 90 degree with respect to the substrate feeding direction X, a moving direction of the jet-flowed solder wave of the molten solder 5 becomes parallel with respect to the bend-preventing plate 6, so that a resistance to the bend-preventing plate 6 is small. Therefore, by slightly heightening the level of the jet-flowed solder than the bend-preventing plate 6, the bend-preventing plate 6 sinks in the jet-flowed solder wave and there is no fear for occurrence of a wave-breaking phenomenon.

[0006] However, as shown in Fig. 4, when the bend-preventing plate 6 is disposed in parallel with the substrate feeding direction X and the solder spray nozzle 4 is disposed so as to be slanted with respect to the substrate feeding direction X, a wave-breaking portion 9 arises at an upper surface 8 of the portion where the jet-flowed solder wave 7 runs into the bend-preventing plate 6, as shown in Fig. 5. This wave-breaking portion 9 is bigger at a portion close to the both side ends 9a, 9c of the substrate feeding direction X of the solder spray nozzle 4, while smaller at a central portion 9b. Consequently, as shown in Fig. 6, regarding a soldering condition of a portion of the substrate 2 where the bend-preventing plate 6 is passing through, there is such a problem that no soldering exists at the portion or an unevenness of the solder.

[0007] The present invention is achieved in view of the above-described

situation, and an object of the invention is to provide a soldering device with which the wave-breaking phenomenon of the jet-flowed solder wave generated by the bend-preventing plate is eliminated and a defect of the soldering at the portion where the bend-preventing plate is passing through is lost, so that a good soldering is carried out.

[0008]

[Means of Solving the Problems] In order to achieve the above-mentioned object, the invention according to claim 1 is a soldering device comprising: a substrate feeding conveyer for supporting both side ends of a substrate and feeding the substrate; a soldering bath, which is disposed at a downward portion of the substrate feeding conveyer and has a solder spray nozzle for spraying a molten solder upward; and a bend-preventing plate, which is provided at an upper portion of the soldering bath so as to extend in a substrate feeding direction and prevents an occurrence of bending of the substrate by coming into contact with a lower surface of the substrate to be fed, in which at least a portion of the bend-preventing plate, that is immersed in a jet-flowed solder wave, is provided with a thin coating having a solder wetting property.

[0009] The feature according to claim 2 is that the solder spray nozzle is disposed so as to have angles of 20 to 50 degrees with respect to the substrate feeding direction.

[0010] According to the soldering device of the invention, the portion of the bend-preventing plate, that is immersed in a jet-flowed solder wave, is provided with a thin coating having a solder wetting property, so that a residence of the jet-flowed solder wave with respect to the bend-preventing plate is lost and the solder can cover an upper portion of the bend-preventing plate. As a result, when the solder spray nozzle is disposed so as to have angles of 20 to 50 degrees with respect to the substrate feeding direction, the wave-breaking phenomenon of the jet-flowed solder wave generated by the bend-preventing plate is eliminated and a good soldering can be carried out.

[0011]

[Detailed Description of the Preferred Embodiment] Hereinafter, one embodiment of the soldering device of the present invention will be described with reference to the drawings. Fig. 1 is a perspective view of a main part showing a schematic feature of one embodiment of the soldering device of the

invention. In Fig.1, same reference numbers are attached to the parts corresponding to parts of the conventional example shown in Fig. 4.

[0012] In Fig. 1, a substrate 2, where a predetermined wiring pattern is printed, is put on a substrate feeding conveyer 1 having a pair of right and left feeding rails 1a, 1b disposed in parallel with predetermined distance, and the substrate 2 is fed by the substrate feeding conveyer 1 driven by a drive unit (not shown) in a direction of an arrowhead X with both side ends thereof supported by the feeding rails 1a, 1b.

[0013] At a downward portion of the substrate feeding conveyer, a box-like soldering bath 3 is disposed, and in the soldering bath 3, a solder spray nozzle 4 is provided in a longitudinal direction. At an upper portion of the solder spray nozzle 4, a rectangular nozzle opening 4a, which opens between the feeding rails 1a, 1b, is formed and the solder spray nozzle 4 is disposed so as to have angles of 20 to 50 degrees with respect to a substrate feeding direction. In addition, at a center of an upper surface of the soldering bath 3 between the feeding rails 1a, 1b a bend-preventing plate 6 is attached so as to be parallel with the feeding rails 1a, 1b.

[0014] The bend-preventing plate 6 consists of a thin-plate-like stainless steel, which has an excellent strength and does not allow the solder to adhere thereto. An upper end surface of the bend-preventing plate 6 is positioned on a substantially same face of the upper surface of the feeding rails 1a, 1b. Further, A portion of the bend-preventing plate 6 immersed in the solder 5 sprayed from the solder spray nozzle 4 is provided with a thin coating 11 having a solder wetting property, in which chemicals such as phosphoric acid is used as auxiliaries.

[0015] Next, a function of the soldering device according to the preferred embodiment constructed as mentioned above will be described. The substrate 2, which completed a provisional mount of electric parts, is put on the pair of feeding rails 1a, 1b and fed by the substrate feeding conveyer 1. The substrate 2 is at first applied with flux by a fluxer (not shown) and then, preheated by the pre-heater (not shown).

[0016] The preheated substrate 2 passes through the soldering bath 3 and at that time, a substantially central portion of the substrate 2 is supported by the bend-preventing plate 6, so that the substrate 2 is not bend downward by its own weight and heating. Then, a jet-flow of the molten solder 5 sprayed from the solder spray nozzle 4 comes into contact with an under surface of the substrate

2, and the molten solder 5 adheres to the soldering position of the substrate 2. At this time, since the portion of the bend-preventing plate 6, which is immersed in the jet-flowed solder wave 7, is provided with the thin coating 11 having a solder wetting property, the jet-flowed solder wave 7 loses a resistance with respect to the bend-preventing plate 6 and as shown in Figs. 2 and 3, the molten solder 5 covers an upper portion of the bend-preventing plate 6.

[0017] According to this preferred embodiments, even when the solder spray nozzle 4 is disposed so as to have angles of 20 to 50 degrees with respect to the substrate feeding direction, the molten solder 5 covers the upper portion of the bend-preventing plate 6. Consequently, a wave-breaking phenomenon of the jet-flowed solder wave 7 is eliminated, and such a problem that no soldering exists at the portion where the bend-preventing plate 6 passes or an unevenness of the solder is prevented, so that a good soldering can be carried out.

[0018] In the above-mentioned embodiment, such a case that the solder spray nozzle 4 is disposed so as to have angles of 20 to 50 degrees with respect to the substrate feeding direction is explained. However, the angle is not limited to angles of 20 to 50 degrees and when the invention is applied to the soldering device disposed at an angle of 90 degrees, the same effect is obtained. In addition, the thin coating 11 can be applied to the entire surface of the bend-preventing plate 6. Furthermore, in a case that plural rows of solder spray nozzles 4 are provided, portions of the bend-preventing plate 6 which oppose the plural solder spray nozzles 4 are provided with the thin coating 11, respectively.

[0019]

[Effects of the Invention] As explained above, according to the soldering device of the invention, at least a portion of the bend-preventing plate provided at the upper portion of the soldering bath, the portion immersed in the jet-flowed solder wave, is provided with the thin coating having a solder wetting property, so that the jet-flowed solder wave loses the resistance with respect to the bend-preventing plate and the molten solder covers the upper portion of the bend-preventing plate. Consequently, the wave-breaking phenomenon of the jet-flowed solder wave generated by the bend-preventing plate is eliminated and the soldering can also be carried out sufficiently and evenly at the portion of the substrate where the bend-preventing plate passes

[Brief description of the Drawings]

[Fig. 1] It is a perspective view of a main part showing a schematic feature of one embodiment of a soldering device of the invention.

[Fig. 2] It is a cross sectional view taken along line A-A in Fig. 1.

[Fig. 3] It is a cross sectional view taken along line B-B in Fig. 1.

[Fig. 4] It is a plan view showing a schematic feature of one embodiment of a conventional soldering device.

[Fig. 5] It is an explanatory view showing a conventional wave-breaking phenomenon.

[Fig. 6] It is a plan view of a substrate showing a solder-adhering situation due to the conventional wave-breaking phenomenon.

[Description of the Reference Numbers]

1 substrate feeding conveyer    2 substrate

3 soldering bath

4 solder spray nozzle

5 molten solder

6 bend-preventing plate

7 jet-flowed solder wave

11 thin coating

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